We claim:

1. A continuous process for the hydroformylation of olefins having at least 6 carbon atoms in the presence of a homogeneous catalyst, wherein

   a) a vertical tall cylindrical reactor (1) whose interior space is divided by means of internals (2) into at least two reaction chambers which extend essentially in the longitudinal direction of the reactor is used,

   b) at least one olefin is introduced into the reactor together with synthesis gas at the lower end of the first reaction chamber,

   c) a partially reacted reaction mixture is conveyed from the upper end of a reaction chamber to the lower end of a next reaction chamber; and

   d) the hydroformylated olefin is taken off at the upper end of the last reaction chamber.

2. A process as claimed in claim 1, wherein a reactor (1) whose interior space is divided by means of internals (2) so that the second and any further reaction chambers are arranged essentially concentrically to the outer wall of the reactor is used.

3. A process as claimed in claim 1 or 2, wherein unreacted synthesis gas is taken from the gas space at the upper end of one or more reaction chambers with the exception of the last reaction chamber and is fed back into the reactor.

4. A process as claimed in claim 3, wherein the synthesis gas which has been taken off is fed back into the reactor by means of a jet pump (10) which is operated by means of the olefin and synthesis gas fed in.

5. A process as claimed in claim 4, wherein the jet pump (10) is additionally operated by means of a partially reacted reaction mixture which is taken off at the lower end of the first reaction chamber.

6. A vertical tall cylindrical reactor (1) for carrying out a process as claimed in any of claims 1 to 5 which is provided with internals (2) by means of which the interior space of

the reactor is divided into at least two reaction chambers which extend essentially in the longitudinal direction of the reactor and means (6) for the recirculation of fluid from the upper end of a reaction chamber to the lower end of a next reaction chamber.

7. A reactor (1) as claimed in claim 6, wherein the second and any further reaction chambers are arranged essentially concentrically to the outer wall of the reactor.

8. A reactor (1) as claimed in claim 6 or 8 having an aspect ratio l/d of from 3:1 to 30:1.

9. A reactor (1) as claimed in any of claims 6 to 8, wherein the last reaction chamber is cascaded by means of horizontal perforated plates (7) located at a distance from one another.

10. A reactor (1) as claimed in any of claims 6 to 9, wherein the height of the second and any further reaction chambers is more than 50% of the height of the reactor (1).